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EXAMINER				
CHENG, JACQUELINE				
ART UNIT		PAPER NUMBER		
3768				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary**Application No.**

09/767,230

Applicant(s)

HIELSCHER ET AL.

Examiner

JACQUELINE CHENG

Art Unit

3768

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 October 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-60 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9, 12, 15-17 and 19-60 is/are rejected.
- 7) ☐ Claim(s) 10, 11, 13, 14 and 18 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/C)
- Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

2. **Claims 28, 56, 58, and 60** are objected to because there is insufficient antecedent basis for the recited limitation "the scattering medium" in step (a). For examination purposes the claim as been examined as if it read --a scattering medium--. Appropriate correction is required.
3. **Claims 29 and 56** are objected to for 101 issues. Step (c) "an initial guess" is not statutory subject matter and cannot be a part of a system claim as it is not something with structure. The examiner suggests "an initial guess" is integrated into step (d) to read --...wherein the prediction is a function of an initial guess of spatial optical properties of the tissue...--.
4. **Claims 59 and 60** are objected to under 37 CFR 1.75 as being a substantial duplicate of claims 57 and 58 respectively. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim 1, 9, 12, 15, 19-23, 28, 29, 37, 40, 43, 47-51, and 56-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schotland (US 5,787,888) in view of Nemati (6,219,575 B1) in view of Vartanian (US 6,163,589).

7. **Claims 1, 15, 28, 29, 43:** Schotland discloses a method and system for reconstructing an image of a scattering medium comprising a source directing energy into the scattering medium at source location on the scattering medium, a detector for measuring the energy emitted from the scattering medium at a detector location on the scattering medium, an internal properties of the scattering medium, means for using an equation of radiative transfer to predict and generate a function of radiative diffusion through the scattering medium, means for generating gradient of the objective function, means for modifying the properties of the scattering medium based on the gradient of the objective function, and means for generating a representation of the internal properties of the scattering medium Schotland further includes a method where properties including at least one of scattering coefficient, an absorption coefficient, an anisotropy factor, and a scattering phase function (col. 4 line 63-col. 5 line 15, col. 5 line 66-col. 6 line 14, col. 6 line 33-62, col. 7 line 38-54).

8. Although Schotland does not explicitly disclose using an integro-differential equation of radiative transfer, in particular one that contains at least a streaming term and an integral term

that accounts for photons being scattered from all direction into a specific direction, Schotland does disclose using an equation of radiative transfer, so it would therefore be obvious to use any well known equation of radiative transfer such as disclosed by Nemati. Nemati discloses a well known equation of radiative transfer given by Chandrasekar, 1960 (see eq (1) on col. 3 line 43) which is an integro-differential equation (as it has both integrals and derivatives) containing a streaming term (left side of the equation) and an integral term that account for photons being scattered from all directions into a specific direction (the second part of the left side of the equation) (col. 3 line 34-61).

9. Schotland also does not explicitly state the radiative transfer of the scattering from the scattering medium is a prediction based on function of initial guess. However, this feature is well known in the art, specifically in x-ray radiation imaging where x-ray radiation goes through scattering that can be predicted by using modeled or initial guess of the scattering boundary based on probabilistic or stochastic process such as Monte Carlo correction as illustrated by Vartanian (col. 2 line 57-col. 3 line 15, col. 3 line 58-col. 4 line 27). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to apply Vartanian's prediction function of x-ray scattering based on initial guess (a priori knowledge) of the scattering characteristics of the region of interest with Schotland's imaging reconstruction method and system to achieve the claimed invention.

10. **Claim 56:** Schotland further discloses in addition to the system described above where the imaging includes spatial distribution of optical properties of tissue (col. 5 line 66-col. 6 line 14).

11. **Claims 57-60:** Schotland discloses in figures 1 and 7 where the system described above includes computer processor 650, which executes computer codes 730 to obtain reconstructed images. More specifically, the computer codes include algorithms to carry out the means described above.
12. **Claims 9, 12, 37, 40:** Schotland discloses that the radiative transfer is detected as the radiative source is diffused in scattering medium such as tissue. The diffusion process of the scattering medium therefore is inherently a time dependent function. On the other hand Nemati teaches a time independent radiative transfer equation (eq. (1)).
13. **Claims 19-22, 47-50:** Schotland discloses a computational method where the objective function is minimized, which includes minimizing at least in one-dimensional line along a direction of the gradient (col. 11 line 29-col. 12 line 8).
14. **Claims 23 and 51:** Schotland discloses that the method above includes near infrared energy (col. 10 line 51-55).
15. **Claims 38, 39, 41, 42:** Although Schotland does not disclose the particular equation as claimed, using the particular integro-differential equations of radiative transfer is functional language. Schotland disclose a means for predicting the energy emerging from the scattering medium, and so therefore fulfills the claim language. Furthermore Schotland discloses a system that is capable of using the particular integro-differential equations claimed.
16. Claims 2-8, 16, 17, 24-27, 30-36, 44-46, and 52-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schotland, Nemati, and Vartanian, as applied to claims 1 and 29 above, and further in view of Sevick-Muraca (US 5,865,754).

17. **Claims 2-8, 30-36:** Sevick-Muraca discloses a fluorescence imaging method and system where the diffusivity of the radiative scattering is determined using threshold settings and iterative processes to determine the predictive absorption coefficient (col. 4 line 51-65, col. 6 line 19-58, col. 9 line 13-30).

18. **Claims 16, 17, 24-27, 44, 45, 52-55:** In addition to the disclosures above, Sevick-Muraca discloses a comparison stage 240 to compare the predictive and measured energy iteratively, and normalizing the detected energy obtained as described by the Jacobian matrices shown in equations 7 and 8 (col. 9 line 13-col. 10 line 28).

19. **Claim 46:** Although the equation used in Sevick-Muraca as a means for generating an objective function using actual measurements and predicted measurements (eq. 5) is not the same as the equation claimed the system of Sevick-Muraca is capable of using the particular objective equation as claimed.

20. Therefore it would be obvious to one having an ordinary skill in the art at the time the invention was made to apply Sevick-Muraca's teaching as describe above to improve the method and system of a device such as Schotland's method and system of reconstructing scattering energy through the target medium to achieve the claimed invention.

Allowable Subject Matter

21. **Claims 10, 11, 13, 14 and 18** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

22. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).
23. A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.
24. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JACQUELINE CHENG whose telephone number is (571)272-5596. The examiner can normally be reached on M-F 10:00-6:30.
25. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Long Le can be reached on 571-272-0823. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.
26. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR

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system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. C./

Examiner, Art Unit 3768

/Long V Le/

Supervisory Patent Examiner, Art Unit 3768